BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a glass bending and tempering apparatus constructed in accordance with the present invention and illustrated with a pair of opposed bending platens in a planar configuration;

FIG. 2 is a plan view of a lower bending platen;

FIG. 3 is a plan view of an upper bending platen;

FIG. 4 is a sectional end view of the apparatus shown in FIG. 1 illustrating actuators connected to the platens and, as shown in phantom, the configuration of the platens in a bent shape;

FIG. 5 is a perspective view of the apparatus illustrating the platens in a planar configuration for receiving a heated glass sheet;

FIG. 6 is a perspective view of the apparatus illustrating the platens having been deformed from the planar shape in FIG. 3 to a bent shape to bend the heated glass sheet;

FIG. 7 is a perspective view of the apparatus illustrating separation of the platens after bending and quenching for removing the heated glass sheet; and

FIG. 8 is a perspective view of the apparatus illustrating the platens after being returned to the planar configuration of the platens after a bending and quenching cycle.

BEST MODE FOR CARRYING OUT THE INVENTION

Referring to FIG. 1 of the drawings, a glass bending and tempering apparatus constructed in accordance with the present invention is generally indicated by reference numeral 10 and used to bend and quench a heated glass sheet 12 at one station. As is hereinafter more fully described, the bending and tempering apparatus 10 reduces roll marking and press face distortion normally associated with conventional bending and tempering systems as well as allowing for use of a lower glass temperature for the combined bending and quenching operation. Furthermore, tempering apparatus 20 is operable for repeatedly bending a glass sheet 12 to a given bent glass sheet shape with greater accuracy than conventional apparatus.

As shown in FIG. 1, the glass bending and tempering apparatus 10 comprises a first platen 14 for receiving the heated glass sheet 12 to be bent. The first platen 14 is deformable and includes an actuator 16 for deforming the platen from a planar shape to a bent shape. Actuator 16 is illustrated as a cable driven mechanical actuator 16', in FIG. 1, and also as a plurality of fluid actuable piston and cylinder arrangements 17, in FIGS. 5 through 8, although it is contemplated within the scope of the invention to utilize a single actuator. Actuator 16 is controllable to control the amount of bending or deformation of the first platen 14 across the platen 14. The first platen includes quench openings 18 throughout a surface 20 of the platen, best seen in FIG. 2. The quench openings 18 are movable with the platen 14 during deformation of the platen which performs the bending.

A second platen 22 also has quench openings 18 throughout a surface 20' of the platen, best seen in FIG. 3. The second platen 22 opposes the first platen 14 with the glass sheet 12 therebetween. The actuator is constrainable and has the ability to lift portions of the first platen a controlled distance to form the desired bent shape in the glass sheet. Preferably, the actuator 16 is